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A DECIMAL GROUPING OF THE PLAGIOCLASES[1]

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The accompanying diagram, which represents about half of the methods according to which the soda-lime feldspars have been grouped, reveals a surprising diversity of usage. Consistency, which undeniably would be of some advantage in the long run, is not likely to obtain until it is demonstrated that some particular scheme is better than all others. That this has not been done is perhaps because it has not been attempted; for, once the matter is given any critical attention, the most convenient and logical adaptation of current nomenclature seems rather easy to find.

The ideal plan should, first, accord with the modern doctrine that the plagioclases form a continuous series; schemes that imply a limited number of compounds (Nos. 1–3) must, therefore, be rejected.

Secondly, the intervals that separate the species in certain plans (Nos. 5, 8, 9) are needless, even when they imply no discontinuity. They then result in eleven-fold instead of sixfold division, compound names, like "andesine-labradorite," being applied to the intervals between the main species; but six terms, with qualifying adjectives, will suffice for as close discrimination as is worth while, and the awkward compound names may be reserved for feldspars that lie virtually at the junction of two species.

Finally, the division should be regular. The question arises here whether the names "albite" and "anorthite" shall be applied only to the pure soda and pure lime feldspars respectively, as in Zirkel's quite regular plan (No. 7), or whether they shall denote a certain range of composition. As absolutely pure end terms are mere abstractions, the answer to this question amounts to a choice between a fourfold and a sixfold division. It is only following universal practice to prefer the sixfold one. Now, there are but two simple ways of dividing regularly a series of six parts: either to give all parts an equal range, or to give the end parts half the range of the others, which are mutually equal. The latter plan

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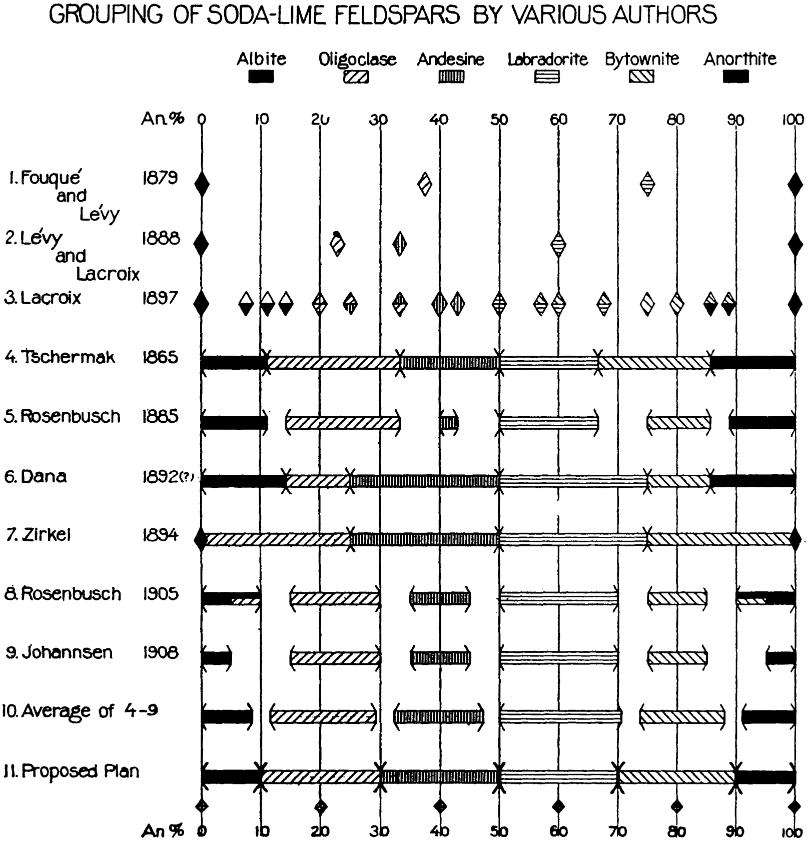

FIG. 1.—Sources of plans illustrated

1. F. Fouqué and A. Michel Lévy, *Minéralogie micrographique*, 1879.
2. A. Michel Lévy and A. Lacroix, *Les Minéraux des roches*, 1888.
3. A. Lacroix, *Minéralogie de la France et de ses colonies*, II (1897), 130.
4. G. Tschermak, "Die Feldspathgruppe," *Sitzungsberichte d. K. Akad.* Wien, L (1865), 566.
5. H. Rosenbusch, *Mikroskopische Physiographie*, etc., 2d ed., 1885 ("nach Tschermak").
6. J. D. and E. S. Dana, *System of Mineralogy*, 6th ed., 1892; also used by J. P. Iddings, *Rock Minerals*, 1906, and by F. W. Clarke, "Data of Geochemistry," *Bull. 330, U.S. Geol. Survey*, 1908.
7. F. Zirkel, *Lehrbuch der Petrographie*, 2d ed., 1894.
8. H. Rosenbusch, *Mikroskopische Physiographie*, 4th ed., 1905, Bd. I, 348.
9. A. Johannsen, *Determination of Rock-forming Minerals*, 1908.
10. Average of 4–9.
11. Decimal grouping.

seems the more logical as well as the more accordant with usage. It leaves equal spaces between the several types; for, if the most typical andesine is average andesine, the most typical albite is pure albite.

It is therefore proposed that the divisions be placed, as in Diagram 11, where the ratios of anorthite to albite are $\frac{1}{10}$, $\frac{3}{10}$, $\frac{7}{10}$, and $\frac{9}{10}$.

The questions of priority and of average practice have thus far been left in the background. If priority determined preference, Tschermak's plan (No. 4) should be preferred; and the belief seems general that his plan is most in use. But, rather oddly, the scheme that currently passes for Tschermak's is a modification thereof by Rosenbusch (No. 5). The scheme proposed in the present note resembles Tschermak's more closely than does any other. Still more closely does it resemble the scheme (No. 10) deduced by averaging the ranges of species in Diagrams 4 to 9. The slightest alteration that will regularize this "average" plan and close its gaps produces the decimal grouping.

A decimal grouping goes naturally with centesimal symbols, of which the most-used form is Ab_nAn_{100-n} (e.g., $Ab_{40}An_{60}$, or $Ab_{25}An_{75}$); these, moreover, present certain practical advantages. They give, more quickly than those like Ab_2An_3 and Ab_1An_3 a definite idea of relative composition—which is merely saying that decimals are more easily subtracted than common fractions. The decimal co-ordinates, too, upon which extinction-angle curves are plotted, indicate the composition corresponding to a given angle in percentages, which it is a needless trouble to reduce to a fraction of a small denominator. Since in such curves the anorthite increases toward the right, it is by the percentage of anorthite, rather than by that of albite, that the composition is naturally measured. Therefore, a symbol such as An 60%, or $An_{.60}$, which indicates this percentage alone, conveys the essential information more economically than the symbol $Ab_{40}An_{60}$; the former's greater convenience, however, is possibly outweighed by the greater currency of the latter.